This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

1 486 359

PATENT SPECIFICATION (11) 1 486 359

(21) Application No. 51217/75 (22) Filed 15 Dec. 1975 (19)
(31) Convention Application No. 534 777 (32) Filed 20 Dec. 1974 in
(33) United States of America (US)
(44) Complete Specification published 21 Sept. 1977
(51) INT. CL.² B66C 23/64
(52) Index at acceptance
B8B 1A 1C2 1C3 1D

(54) TELESCOPIC BOOM FOR A CRANE

(71) We, HARNISCHFEGER CORPORATION, a corporation organized and existing under the laws of the State of Delaware, having its principal place of business at 4400 West National Avenue, West Milwaukee, Wisconsin, U.S.A., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a telescopic boom for a crane.

Some mobile cranes have a multisection telescopic boom and a jib attachable or swingable into a position at the end of the boom to extend its working length. In some cases the jib is permanently connected to the boom and is swingable into and out of working position. In other cases the jib is completely detachable and is stored alongside the telescoped boom during road transport but can be made ready for use by pivotally connecting the base end of the jib to the point end of the boom, whereupon the jib is swung into alignment with the boom secured in place. U.S. Patents 3,366,250, 3,698,569, 3,785,505 and 3,830,376 exemplify boom and jib arrangements of the aforesaid types. In the aforementioned patents where a multisection telescopic boom is employed, no provision is made to guard against accidental telescoping of extended boom sections under the weight of the jib in the event of a hydraulic system failure, for example. The present invention makes such provision.

The present invention provides a telescopic boom for a crane comprising a first hollow boom section having a forward end and a second boom section having a forward end and a rear end and telescopically movable within said first boom section between a retracted position and a fully extended position; means for selectively moving said second boom section between said retracted and extended positions: and releasable locking means for maintaining said second boom section in fully extended position, said releasable locking means comprising; abutment means mounted on the exterior of and near the rear end of said second boom section and telescopic within said first boom section; and a locking assembly mounted on the exterior of and near the forward end of said first boom section and comprising: a support rigidly secured to said first boom section; a locking member rotatably mounted on said support, said locking member being selectively rotatable between one position in the path of movement of said abutment means and another position out of said path of movement of said abutment means, and overcenter biasing means connected between said locking member and a fixed point on said first boom section for maintaining said locking member in either of its said positions, said biasing means permitting said locking member to be temporarily rotatable in one direction from the path of movement of said abutment means by said abutment means as said second boom section is extended, said locking member being rotatable in an opposite direction into interfering abutting relationship between a portion near the forward end of said first boom section and said abutment means if said second boom section is moved toward retracted position while said locking member is in said one position.

A mobile crane having a telescopic boom and a releasable locking means in accordance with the present invention offers many advantages over prior art arrangements. The locking means make for safer operation of the crane when a jib for extending the reach of the boom is interconnected with the boom since telescoping of the one section of the bottom under the weight of the jib in the event of hydraulic failure cannot occur and result in accidental tilt or collapse of the jib due to slackening of jib supporting guy lines.

The invention will now be described further with reference to the accompanying drawings in which:

Figure 1 is a side elevational view of a mobile crane having a multisectioned telescopic boom and having a jib for extending the reach of the boom disposed alongside

the boom in stored position according to the invention;

Figure 2 is a front end view of the mobile crane shown in Figure 1;

Figure 3 is a side elevational view of a portion of the mobile crane shown in Figure 1 but showing the crane upper section reversed and showing the jib swung into alignment with and connected to the main boom;

Figure 4 is a view similar to Figure 3 but showing the fly section of the main boom extended and the jib mast erected;

Figure 5 is a view similar to Figure 4 but showing the boom fully extended toward the ground and showing the jib point section detached;

Figure 6 is a view similar to Figure 5 but showing the boom partially retracted and several jib sections disposed on the ground;

Figure 7 is a view similar to Figure 6 and showing the boom fully extended and four jib sections connected together to form the jib;

Figure 8 is a side elevational view of the mobile crane with its main boom fully extended and fully raised and with a multi-sectioned jib disposed in operating position;

Figure 9 is a plan, enlarged relative to previous Figures, view of the point or free end of the boom and the base end of the jib taken on line 9—9 of Figure 1;

Figure 10 is a plan view of the point end of the boom and the base end of the jib taken on line 10—10 of Figure 3;

Figure 11 is a detailed view of a portion of the hinge means shown in Figure 9 and showing the hinge means in an alternate position;

Figure 12 is a side elevational view of the point end of the boom and the base end of the jib taken on line 12—12 of Figure 10;

Figure 13 is a view of the point end of the boom and the base end of the jib taken on line 13—13 of Figure 10;

Figure 14 is an exploded isometric view of the point end of the boom and the base end of the jib;

Figure 15 is an isometric view of the under side of the point end of the boom and shows a locking means betwen the fly section of the boom and the adjacent boom section;

Figure 16 is an enlarged cross sectional view of the locking means shown in Figure 15;

Figure 17 is a view of the locking means taken on line 17—17 of Figure 16 with certain parts in cross section;

Figure 18 is an enlarged cross sectional view of the front jib storage support assembly taken on line 18—18 of Figure 1;

Figure 19 is an enlarged detailed view of a portion of the jib storage support assembly taken on line 19—19 of Figure 18;

Figure 20 is a top plan view of the jib storage support assembly shown in Figure 18 and showing it in an alternate or stored position;

Figure 21 is a perspective view showing the jib storage support assembly in stored position; and

Figure 22 is a perspective view showing the jib being moved onto the jib storage support assembly.

Referring to Figures 1 to 8, there is shown a mobile crane which comprises a lower unit 10 in the form of a vehicle such as a truck and an upper unit 11 which is mounted for horizontal rotation in either direction on the lower unit by means of a conventional turret 17. Truck 10 comprises a chassis 12 on which are mounted ground wheels 13, extendable outriggers 14, a driver's cab 15 and an internal combustion engine 16 beneath the cab for driving the ground wheels. Upper unit 11 comprises a supporting framework 20 on which are mounted a telescopic boom B, main and auxiliary winches W1 and W2, respectively, on which load hoist lines MH and AH, respectively, are wrapped, a crane operator's cab 21, and an internal combustion engine 22 for driving a hydraulic pump 23 which supplies operating fluid for the winches W1 and W2 and hydraulic cylinders hereinafter described.

Boom B, which is shown in a generally horizontal telescoped and stored position lengthwise of truck 10, comprises four hollow boom sections, namely: a base section BI, an inner midsection BII, an outer midsection BIII, and a fly section BIV. Boom base section BI is pivotally connected to framework 20 of upper unit 11 by pin means 24. Extendable and retractable hydraulic boom hoist cylinders 25 are provided to raise and lower boom B and each is pivotally connected to and between framework 20 and boom base section BI by pin means 26 and 27, respectively. Fly section BIV is provided, at its point or free end, with a working head 34 on which a sheave 35 for a load hoist line MH is rotatably mounted. Boom B is fully extendable, for example, to about 105 feet.

As Figure 8 shows, extendable and retractable hydraulic boom extension cylinders 30, 31 and 32 are located within boom B and are connected to boom sections BII, BIII and BIV, respectively, to effect axial extension and retraction of the latter. Control means (not shown) are understood to be provided to operate the cylinders 30, 31 and 32 either individually or in unison, depending upon the crane operator's choice.

The mobile crane has an optionally useable lattice-type jib J storable alongside boom B, with the base end of the jib adjacent the point end of the boom. Jib J is shown in Figures 1 to 5 as comprising two hollow lattice-type jib sections, namely

a jib base or foot section JI about 20 feet long and a jib fly or point section JIV about 10 feet long. When jib J is stored alongside the boom, as shown in Figures 1 and 2, it is reversely disposed with respect to boom B, i.e., its foot end is adjacent, near or toward the point of boom B and its point end is adjacent, near or toward the base of foot end of boom B. Jib fly section JIV is provided with a working head 34A at the jib point on which a sheave 35B for load hoist line AH is rotatably mounted. Jib J is adapted, for example, to extend the length of boom B by about 30 feet or more, depending on the number of jib sections used. In Figure 8, jib J comprises four sections, JI, JII, JIII and JIV.

The point end of jib point section JIV is also provided, as Figures 1, 3 and 4 show, with a fan-shaped cable support member 39 in the form of a pair of plates which are rigidly secured to the jib section and is provided with a plurality of holes to which the forward guy lines may be anchored as hereinafter explained. The jib point section JIV is detachably secured to jib base section JI by suitable removable pins.

One side of the boom base section BI is provided with a pair of longitudinally spaced apart jib storage support assemblies 36 to facilitate storing and installing the jib J. As Figures 9 to 14 show, the point end of the boom fly section BIV and the base end of the jib J are provided with cooperating disconnectable hinge members 37 and 38, respectively, for attaching the jib J to the boom B so that the jib can be swung horizontally between stored and installed positions, as comparison of Figures 1 and 4 shows. The point end of the boom fly section BIV and the base end of the jib J are provided with connection means, including a cylindrical rod 40 on the boom fly section head 34 and cooperating journal bearings 41 on the jib, for securing the jib to the boom in either axial aligned position, shown in Figure 3, or in downwardly tilted position, shown in phantom in Figure 8, and adjustable strut means or members 105, shown in Figures 7, 8, 12 and 13, are detachably connected between the boom and jib to limit the extent to which the jib can be tilted. The jib J is provided with a self-storing and self-erecting jib mast M which is pivotally mounted on the upper side of the jib which cooperates with forward and rearward guy lines GF and GR, respectively, to support the jib during set-up and operation of the crane. Releasable locking means 43, best seen in Figures 15, 16 and 17, are provided on the boom fly section BIV and the next adjacent intermediate boom section BIII to prevent the extended boom fly section from accidentally telescoping under the weight of the jib J in the event of a hydraulic system faihure.

Jib storage support means are provided to facilitate storing and installing the jib J. As Figure 1 shows, one side of the boom base section BI is provided with a pair of longitudinally spaced apart front and rear identical jib storage support assemblies 36 to facilitate storing and installing the jib. As Figures 18 to 22 make clear, each support assembly 36 comprises a mounting bracket 75 and a hollow rigid support member or beam 76 which is pivotally mounted thereon so that it can be swung between a supporting position (Figure 18) and a stored position (Figure 20). Each support assembly 36 further includes a laterally extending member 77 which is pivotally mounted on support member 76 and tiltable between a horizontal position (shown in solid lines in Figure 18) and a downward position (shown in phantom lines in Figure 18) so that the jib J can be easily swung thereonto for storage and then subsequently locked into horizontal position by locking clamps 78 to secure the jib on the support assembly. Each storage assembly 36 comprises a mounting bracket 75 which is rigidly secured to the side of boom base section BI. The bracket 75 comprises a rear plate 79, two laterally extending vertically spaced apart upper and lower hinge plates 80 which are rigidly secured, as by welding, to the rear plate, and suitable gussets 81 which are rigidly secured between the rear plate and the hinge plates. The hinge plates 80 are each provided with a hole 82 for accommodating a vertically extending hinge pin 83. The hollow rectangular support or box beam 76 has its inner end disposed between the upper and lower hinge plates 80 and is pivotally secured thereto by means of the hinge pin 83 which extends through holes 84 in the beam 76. The beam 76 is movable between an extended position wherein it projects outwardly from the side of the boom as shown in Figure 22, and a stored position wherein it is disposed alongside the boom, as shown in Figure 20. The beam is provided with a pair of longitudinally spaced apart pin holes 86 and 87 therethrough for accommodating a locking pin 89 and a pivot pin 90, respectively. U-shaped member 77 for directly supporting the jib J in stored position is pivotally connected to the box beam 76 by pin 90. The U-shaped member 77 is provided with a pair of holes 92 and 93 which register with the pair of holes 86 and 87, respectively, in the box beam 76. When the jib J is in stored position, as shown in Figure 18, the member 77 is parallel with the box beam 76 and both the pins 89 and 90 are in place. To facilitate the placement or re-

moval of the jib on or from the support assemblies 36, only the pivot pin 90 is kept in place and this allows the member 77 to move between the horizontal and the downwardly tilted positions shown in Figure 18. To store, the jib J is swung across the downwardly tilted member 77 which rides up the inclined plane partially braking the rotational momentum. The member 77 then assumes the horizontal position and the locking pin 89 may then be secured in place. Conversely, to unstore, the locking pin 89 is removed and member 77 tilts downwardly to reduce friction as the jib J swings away from the side of the boom B. The member 77 is provided with a pair of generally L-shaped clamps 78, one of which is pivotally connected at one end thereof by a pin 93A and which is movable to a position clear of the jib (as shown in Figures 21 and 22) when the jib is being stored or unstored. After the jib J has been properly positioned for storage on the support means 36, the clamp 78 is swung to the locking position shown in Figure 18 and secured in place by means of the locking bolt 95. The inner clamp 78 is also provided with a locking bolt 95. The box beam 76 is lockable in either its extended or stored position by means of a removable lock pin 97 which is extendable through a hole 98 in a plate 99 attached to plate 79 and a hole 100 in box beam 76. Pin 97 can be removed after a pin 97A is withdrawn.

As Figure 14 best shows, the working head 34 on boom section BIV comprises a rear plate 50 which is rigidly secured, as by welding, to the outermost forward end of the fly section and two laterally spaced apart side plates 51 which are rigidly secured, as by welding, to the rear plate 50. The two side plates 51 are further rigidified by a plurality of cross members 52 which are welded therebetween. The working head 34 supports the cylindrical rod 40 which extends through a tube 53 which is welded between the plates 51. The rod 40 extends outwardly for a short distance from the outer ends of tube 53 and is secured to the tube by a pin 53A. The outwardly extending ends of rod 40 serve as a means by which the jib J is connected to boom B as hereinafter explained.

Hinge means are provided for connecting the jib J so that it can be swung horizontally between stored and installed positions. The point end of the boom fly section BIV and the base end JI of the jib J are provided with cooperating disconnectable hinge assemblies 37 and 38, respectively, for attaching the jib to the boom so that the jib can be swung horizontally between stored and installed positions. The hinge assemblies 37 and 38 enable the jib J to be pivotally connected to the boom B, by hinge links 56, while still in stored position and then swung between the stored position and a position in alignment with the boom. The hinge assemblies 37 and 38 are disconnectable from each other by detachment of the links 56 during jib storage so that the boom B can be used independently of the jib J. The hinge assemblies 37 and 38 are also disconnectable after the jib J has been secured to the boom B so that the jib can be placed in a downwardly tilted position with respect to the boom, either for the purpose of connecting additional jib sections such as JII and JIII or for the purpose of allowing the jib axis to be offset from the boom axis to suit particular job conditions.

As Figures 9 through 14 show, the outer side of one side plate 51 of working head 34 is provided with a pair of vertically spaced apart substantially identical hinge assemblies 37 for pivotally connecting the base end of jib J to head 34 at the point end of boom B. Each hinge assembly 37 comprises a back plate 57 which is welded to its associated side plate 51 and two horizontally disposed vertically spaced apart laterally extending upper and lower plates 54 and 55, respectively, which have a plurality of holes 58, 59, 60 and 61 therethrough, the holes in upper plate being in registry with the holes in the lower plate. Each hinge assembly 37 is adapted to accommodate a detachable hinge link 56 which can be disposed between the plates 54 and 55 and pivotally secured thereto by means of a central hinge pin 63 through the central hole 59 in the plates 54 and 55 and a hole 65 in the link. During road transport of the jib J the link 56 is secured in the forward position shown in phantom in Figure 9 by means of a second hinge pin 63A in the front hole 61 in the plates 54 and 55 and the center hole 64 in link 56 and is not attached to the jib. As Figures 9 and 10 show, however, when the jib J is to be swung from its stored position to its installed position, the outermost end of the link 56 is connected to the associated hinge member on the base end of the jib. As the jib J is swung into position, it is capable of pivoting about hinge pin 63A, which is then disposed in hole 66 in link 56 and the holes 68 in the hinge assembly 38 on the jib J.

The base end of the jib base section JI is provided with a pair of vertically spaced apart hinge assemblies 38 which are welded thereto and cooperate with the hinge assemblies 37 on the working head 34 of the boom B. Each hinge assembly 38 comprises a pair of horizontally disposed vertically spaced apart rigid plates 108 having the aligned holes 68 therein and between which plates 108 the link 56 can be fitted.

Connection means are provided for securing the jib J to the boom B in either axially aligned position (see Figures 3 to 8) or in downwardly tilted position (see Figure 8 phantom showing). The point end of the boom fly section BIV and the base end of the jib J are provided with connection means, including the cylindrical rod 40 on the boom fly section and the cooperating journal bearings 41 on the jib, for enabling the jib to be secured to the boom in either axial aligned position or in downwardly tilted position, and adjustable detachable strut means, including a pair of laterally spaced apart struts 105, are detachably connected between the boom and jib to limit the extent to which the jib can be tilted for erection and to provide backstop means. The connection means for securing the jib J to the boom B also enable the jib to be self-positioned as it is swung into axial alignment with the boom. As hereinbefore explained, the base end of the jib base section JI is provided with shimmed journals 41 which are adapted for mating with and connection to the outwardly projecting ends of the cylindrical member 40. Each journal 41, which is secured to the jib J by bolts 111, comprises a semicircular groove 112 for engagement with an end of the pin or member 40. Each journal 41 is further provided with a pair of spaced apart threaded holes 114 for accommodating, as Figure 13 shows, bolts 115 which secure a complementary journal cap 116 to the journal 41 into position thereon to encircle the end of member 40 and secure the jib to the boom. This arrangement permits the jib J to be pivotally movable with respect to the boom B for two purposes, namely: to enable the jib to be pivoted downwardly (by slacking off on the rear guy lines GR) and supported on the ground when the boom is horizontal so that additional jib sections can be attached or removed, and to allow the jib to be pivoted to the position shown in Figure 8 when circumstances so require. Spacers 42 are provided to prevent lateral shifting of the jib J.

As Figures 12 and 13 best show, means are provided to prevent the jib J from assuming an excessively tilted position with respect to the boom B. During erection such means comprise a pair of laterally spaced apart struts 105, each of which is pivotally connected to and removably detachable from a pin 161 on the working head 34 of the boom B and a pin 109 near the base end of the jib section JI. In Figures 12 and 13 a strut 105 is shown in its nearly extended position. It is to be understood, however, that each strut can be telescoped to allow the jib to take the position indicated in Figure 8 by the 15° displaced axis line. Backward tilt of the jib is limited to 5° backward tilt by U.S. federal regulations. Each strut 105 comprises a hollow sleeve portion 106 which is pivotally connected at one end, as by pin 109, to a bracket 110 rigidly secured to jib J. Each strut 105 further comprises a rod 107 which is adapted to move within sleeve 106 between two extreme positions. as by pin 161 and a cap 107A, so as to Rod 107 is pivotally connected at one end, be secured to working head 34 of the boom B.

A self-storing and self-erecting jib mast M is provided on jib J for supporting the jib during rigging and operation of the crane. The jib mast M is pivotally mounted on the upper side of the jib J and cooperates with the guy lines GR and GF to support the jib during set-up and operation of the crane. The jib mast M has its lower end pivotally connected by pins 120 to brackets 121 located on the top side of the base end of the jib J so that it can assume a stored position wherein it lies on the jib (see Figures 1 and 3) and from which it can automatically be raised into supporting position, as shown in Figure 4 and elsewhere. In practice, the rear and front guy lines GR and GF, respectively, are connected between a bracket 122 at the upper end of the mast M and to brackets 123 on boom section BIII and an erection link 124 on the jib J, respectively, while the mast is in lowered or stored position. The rear guy line GR is anchored to bracket 123 on the intermediate boom section BIII so that, upon extension of the fly section BIV of the boom B, the mast M is automatically raised and the guy lines GR and GF are tightened thereby supporting the jib either for working purposes or while additional jib sections are connected. If more than one jib section such as JI is to be employed, the front guy line GF which is normally connected between the mast M and the end of the jib base section JI is replaced by a longer front guy line (as Figure 7 shows) which is connected between the mast M and the point end of the jib point section JIV after the additional jib sections JII and JII have been connected. As Figure 14 shows, jib mast M comprises a pair of laterally spaced apart rigid side members 126 which are interconnected by a plurality of lateral support braces 127. The uppermost end of each side member 126 is provided with a bracket 122 which is rigidly secured, as by welding, to the side member and is provided with a pair of holes 128 (shown in Figures 1 and 4) for facilitating the attachment of the guy wires. A sheave 130 is provided on the mast M to accommodate the load line AH. as Figure 8 shows, and prevent it from being snagged if the jib J is tilted from the axially aligned position shown in Figure 8 to a tilted position

indicated by the 15° displaced axis line in Figure 8. The sheave 130 is rotatably supported on a pin 131 which, in turn, is mounted on a pair of brackets 132 which are rigidly secured between a pair of adjacent cross braces 127, as Figure 14 best shows. Figure 14 also shows that the lower ends of the side members 126 of the mast M are pivotally connected by means of pins 120 to brackets 121 which are rigidly secured in spaced apart relationship at the base end of jib section JI.

As Figures 15, 16 and 17 best show, a releasable safety locking means, for preventing the extended boom fly section BIV from accidentally telescoping inwardly into its adjacent intermediate boom section BIII under the weight of the jib J in the event of a hydraulic system failure or inadvertent operation of the retract telescope means by the operator (which allows the fly cylinder to retract), take the form of a jam plate 140 rigidly mounted at or near the base end of the extended boom fly section BIV, which plate 140 is engageable in interfering relationship with a selectively movable spring-biased locking member 141 of a locking assembly 142 mounted at or near the outer end of the adjacent intermediate boom section BIII.

The jam plate 140 is on the underside of the base end of the boom fly section BIV to prevent the fly section from accidentally telescoping back into the intermediate section BIII after the fly section BIV has been extended to the position shown in Figure 8 in the event that a holding valve (not shown) in the hydraulic operating circuit for holding the fly section BIV extended fails or the retract telescopic lever is accidentally engaged for the fly section. The jam plate 140 is adapted to cooperate with the locking assembly 142 which is provided on the underside of the intermediate boom section BIII near the forward end thereof. The locking assembly comprises a base plate 143 which is secured, as by welding, to intermediate boom section BIII and a pair of laterally spaced apart downwardly depending side plates 144 which are rigidly secured, as by welding, to the base plate 143. Each side plate 144 is provided with a pin hole 145 for rotatably accommodating the end of a pin 146 therethrough. One end of the pin 146 is provided with a pin lever 147 which is rigidly secured thereto, as by welding, and the other end of the pin 146 is provided with a cotter key 148 in a hole therethrough. The locking member 141 is rigidly secured to and extends radially outwardly and rotatable with a sleeve 149 which is mounted on the pin. The hollow cylindrical sleeve 149 is disposed on pin 146 between the side plates 144 and is connected thereto for movement therewith by a pin 150. The radially extending member 141 is rigidly secured to the sleeve 149 as by welding at 152. In Figures 15, 16 and 17 the boom fly section BIV is shown as fully extended from the intermediate boom section BIII, and the locking member 141 is shown in locking position wherein it is disposed in the path of the jam plate 140 and would prevent retraction of the fly section. The locking member 141 is maintained in locking position by means of the coiled tensioning spring 154 which has one end connected to a bracket 155 rigidly secured to a side plate 144 and has its opposite end connected to a pin 157 extending outwardly of the lever 147. The biasing spring 154 holds the locking member 141 in the locking position shown in solid lines in Figure 16 during operation of the crane. However, when it is desired to release the locking member to permit retraction of boom fly section BIV, the locking member 141 is rotated manually in a clockwise direction to its alternate position, as shown in phantom lines in Figure 16, out of the path of the jam plate 140. As the locking member 141 is rotated, the biasing spring 154 is caused to extend slightly and moves overcenter into an alternate position wherein it subsequently biases the locking member 141 against a lateral brace plate 160.

The crane operates in the following manner, assuming that all components are in the condition shown in Figures 1 and 2, the boom B is fuly retracted, and the jib J is swung into stored position on the boom support assemblies 36 and locked thereon. Further assume that the hinges are in the condition shown in Figure 11 wherein the hinge elements 38 on jib J and the hinge elements 40 on boom B are disconnected and the link 56 is secured in open position by means of pin 63A.

To set up the jib J for operation it is preferable to swing the crane upper unit 11 from the position shown in Figure 1 to the reversed position shown in Figure 3 and to extend the outriggers 14. The locking clamp bolts 95 shown in Figure 18 are then removed and the outermost clamp 78 is swung down to its open position. The hinge links 56 are then moved from the position shown in phantom in Figure 9 and attached to the jib J as shown in Figure 9, whereupon jib J is swung horizontally manually to the position shown in Figure 10 into alignment with boom B. It is to be understood that prior to swinging of jib U to the position shown in Figure 10 the journal caps 116 must be removed from the journals 41 so that the latter can make proper engagement with the ends of the horizontal pin 40. Thereafter, with the jib J in the position shown in Figure 10, the caps 116 are secured to the journals 41.

Before an attempt is made to swing jib J horizontally from the jib support assem-

blies 36 it is necessary to remove the locking pins 89 of the jib support assemblies so that the members 77 can tilt downwardly as the jib slides outwardly thereacross. The downwardly tilting action of the members 77 reduces frictional forces between the jib J and the upper surfaces of the members 77 and facilitates removal of the jib from the jib storage assemblies 36. When the jib J is clear of the jib support assemblies 36, each assembly may be placed and locked in the stored position shown in Figure 20. If the jib is to be employed in axial alignment with boom B, the links 56 must be swung to the rearward position (Fig. 11) and the furnished guy lines, properly connected, will provide the aforementioned alignment.

At this point jib J is in the position shown in Figure 3 and mast M is still in stored position. It will be noted, however, that the guy lines GR and GF are attached as hereinbefore described. To erect the mast and render the guy lines taut, boom fly section BIV is extended from the position shown in Figure 3 to the position shown in Figure 4, whereupon rear guy lines GR become taut and raise mast M and forward guy lines GF become taut to effectively support jib J. It will be noted from Figure 4 that, with boom fly section BIV fully extended, the locking means 142 are brought into play and prevent inadvertent or accidental retraction of boom fly section BIV which would cause the guy lines to slacken.

When jib J has assumed the position shown in Figure 3, the struts 105 are installed as shown in Figures 12 and 13. Once the jib J is secured with the journal caps 116 secured to pin 40 as shown in Figure 4 and the struts 105 are in place, then the jib guy line GF is disconnected from the erection link 124 by retracting boom section BIV to slacken the guy lines or cables and an additional jib JIV guy line is connected to guy line GF and fan item 39, made reasonably taut, and the links 56 swung to the jib operating position as shown in Figure 11. The crane may be used in the conventional manner by rigging the hoist lines as desired and by extending the various boom sections to the desired length for the basic 30' jib length.

Figures 5, 6 and 7 show the manner in which the jib J may be extended by the addition of other intermediate jib sections thereto. As Figure 5 shows, boom B is extended to its full length in a slightly downward direction so that the jib point section JIV rests on the ground and can be detached from jib base section JI. Boom B is then retracted, as shown in Figure 6, to provide space for insertion, for example, of additional jib sections JII and JIII between the jib sections JI and JIV. When the sections JI, JII, JIII and JIV have been interconnected, the relatively short forward guy line GF is replaced by additional guy lines GF1, GF2, GF3, GF4 as shown in Figure 7. GF4 is then connected to fan 39 in a hole stamped to indicate jib length. Figures 7 and 8 show jib J in an arrangement where it is in axial alignment with boom B. However, jib J can also be employed in a downwardly tilted position as indicated by the 15° displaced axis line in Figure 8. To accomplish tilting of jib J it is necessary that the point of the jib J be rested on the ground as shown in Figure 7. It is also necessary to then retract fly BIV, after the latch is released, so that the guy line GR will slacken to allow insertion of suitable links between GR and 123 or to use a relatively longer guy line in order for the multisection jib J, shown in Figures 7 and 8, to assume the tilted position indicated in Figure 8. The connector 39 permits forward guy lines to be attached to the point end of jib J for purposes of adding extra jib sections with guy lines of corresponding equal length to be added.

Jib J is disassembled and stored by reversing the procedural steps indicated above. More specifically, if a multisection jib J has been used, the procedures shown in Figures 5, 6 and 7 are reversed. If a jib J comprising merely a base section JI and a point section JIV is employed, as shown in Figures 1, 3 and 4, then the procedural steps shown in those figures are reversed. Before boom fly section BIV can be retracted into intermediate boom section BIII it is necessary that the locking member 141 of the locking 142 be swung from the locking position shown in solid lines in Figure 16 clockwise to the unlocked position shown in phantom lines in Figure 16. When this is done it is possible for jam plate 140 to move past the position formerly occupied by locking member 141. position shown in Figure 3 to the stored When jib J is ready to be swung from the position shown in Figure 1, it is necessary beforehand to swing the jib support assemblies 36 into proper position and to lock them in place by the locking pins 97 and to remove the locking pins 89 so that the members 77 thereof can assume their downwardly tilted position, shown in Figure 18. This allows jib J to slide into engagement with the members 77 while gradually moving them into their horizontal jib storage position and into a position where the locking pins 89 can again be inserted. When jib J is finally in place the outermost locking clamp 78 may be swung into the position shown in solid lines in Figure 18, and the locking bolts 95 may be inserted to fully engage the clamps 78 around the longitudinal members of jib base section JI.

Reference is made to our copending applications 51216/75 (1,486,358) and 51218/75 (1,486,360).

WHAT WE CLAIM IS:—

1. A telescopic boom for a crane comprising: a first hollow boom section having a forward end and a second boom section having a forward end and a rear end and telescopically movable within said first boom section between a retracted position and a fully extended position; means for selectively moving said second boom section between said retracted and extended positions; and releasable locking means for maintaining said second boom section in fully extended position, said releasable locking means comprising: abutment means mounted on the exterior of and near the rear end of said second boom section and telescopable within said first boom section; and a locking assembly mounted on the exterior of and near the forward end of said first boom section and comprising: a support rigidly secured to said first boom section; a locking member rotatably mounted on said support, said locking member being selectively rotatable between one position in the path of movement of said abutment means and another position out of said path of movement of said abutment means, and overcenter biasing means connected between said locking member and a fixed point on said first boom section for maintaining said locking member in either of its said positions, said biasing means permitting said locking member to be temporarily rotatable in one direction from the path of movement of said abutment means by said abutment means as said second boom section is extended, said locking member being rotatable in an opposite direction into interfering abutting relationship between a portion near the forward end of said first boom section and said abutment means if said second boom section is moved toward retracted position while said locking member is in its said one position.

2. A boom according to Claim 1 wherein said locking assembly comprises a shaft means rotatably mounted on said support, said locking member being secured to and rotatable with said shaft means, and a lever arm secured to and rotatable with said shaft means, said overcenter biasing means being connected between said lever arm and said fixed point.

3. A telescopic boom as claimed in claim 1 having releasable locking means, for maintaining said second boom section in fully extended position, substantially as hereinbefore described with reference to the accompanying drawings.

4. A crane including a telescopic boom as claimed in any preceding claim.

For the Applicants,
WILSON, GUNN & ELLIS,
Chartered Patent Agents,
41—51 Royal Exchange,
Cross Street,
Manchester M2 7DB.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1977.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

1486359
10 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale

Sheet 1

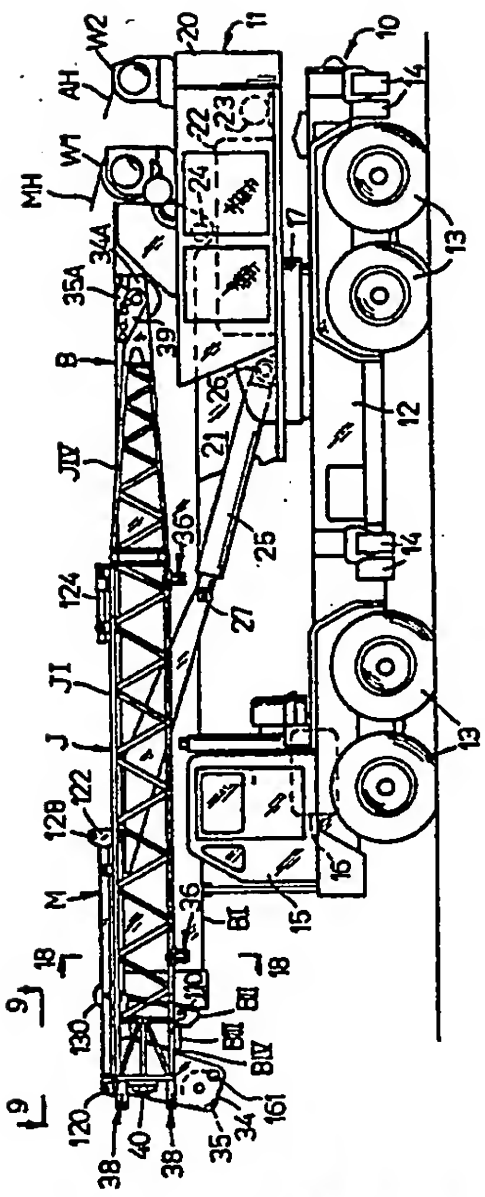


FIG. 1

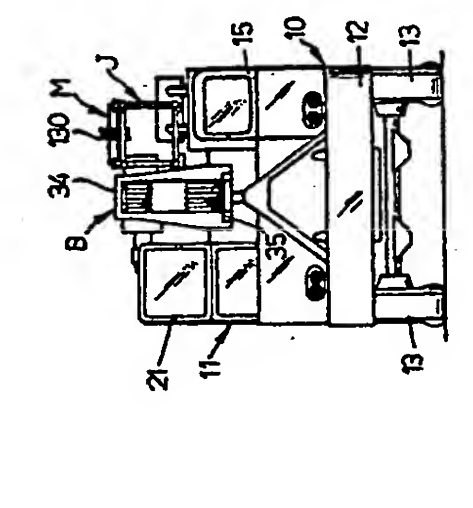


FIG. 2

1486359
10 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale

Sheet 2

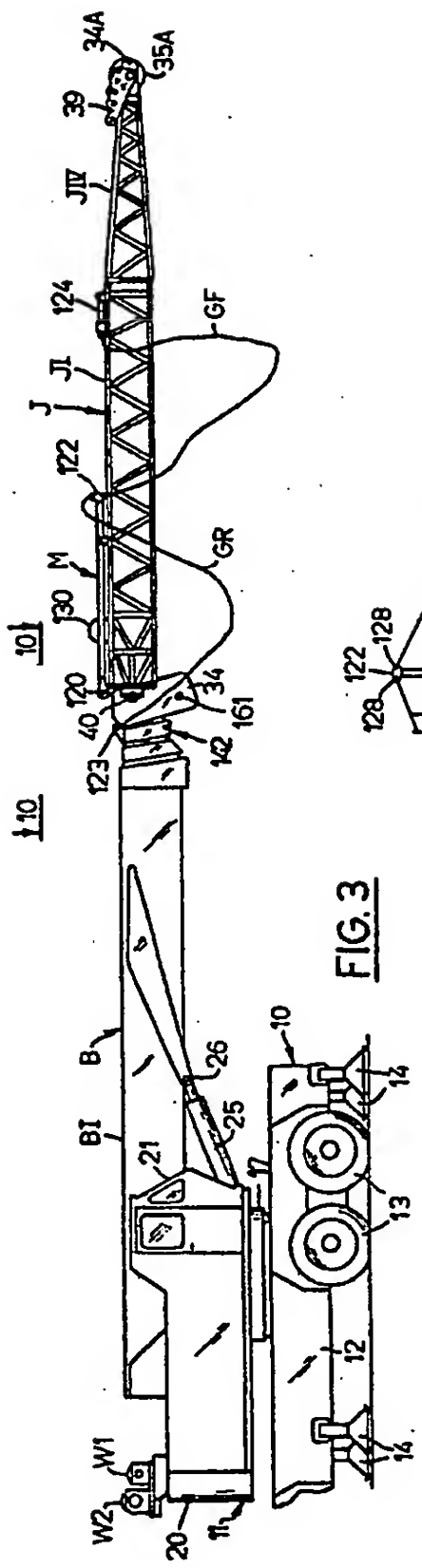


FIG. 3

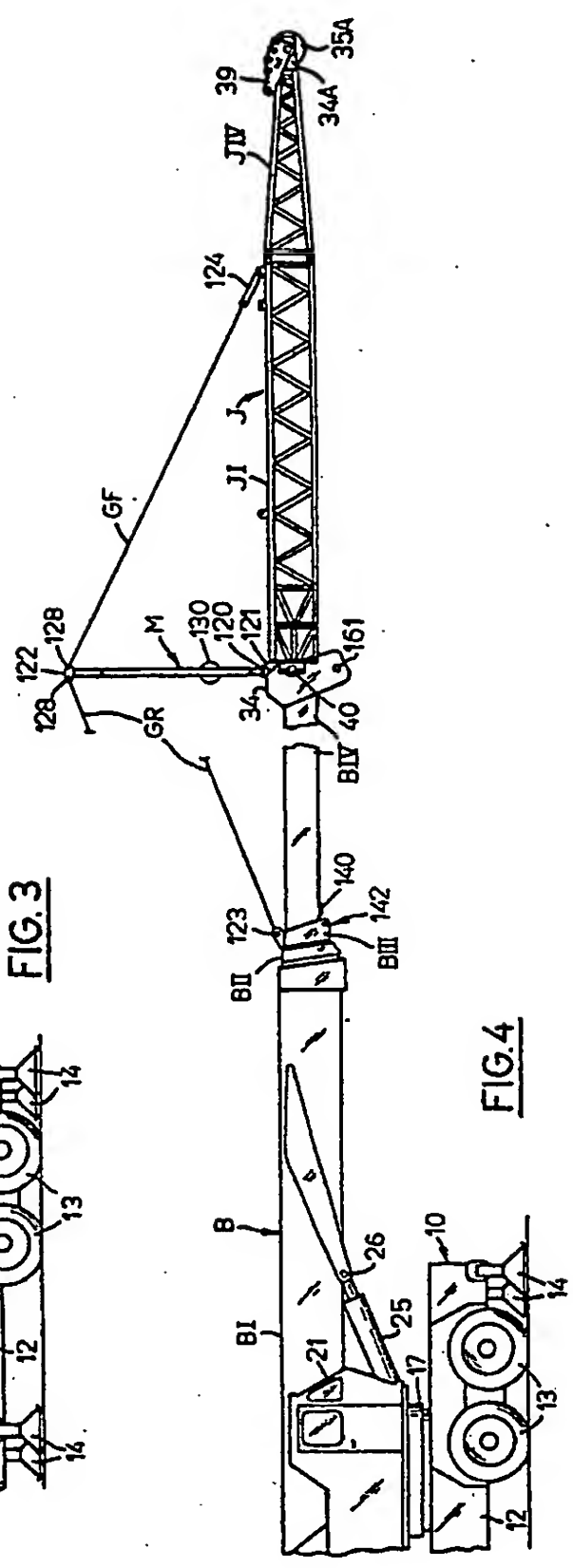


FIG.4

1486359 COMPLETE SPECIFICATION
10 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 3

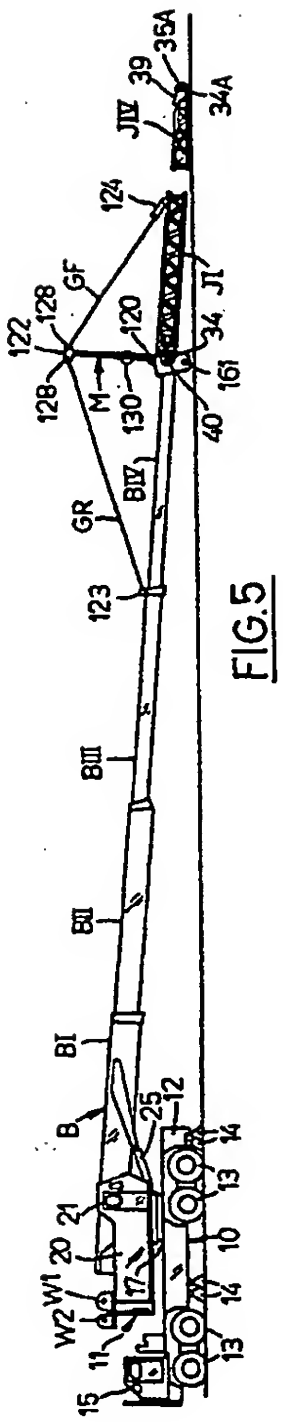


FIG.5

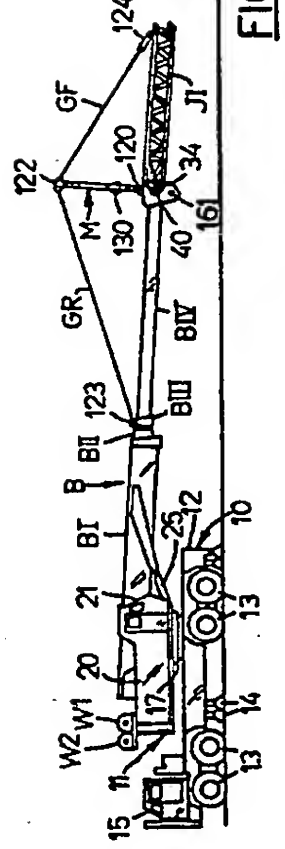


FIG.6

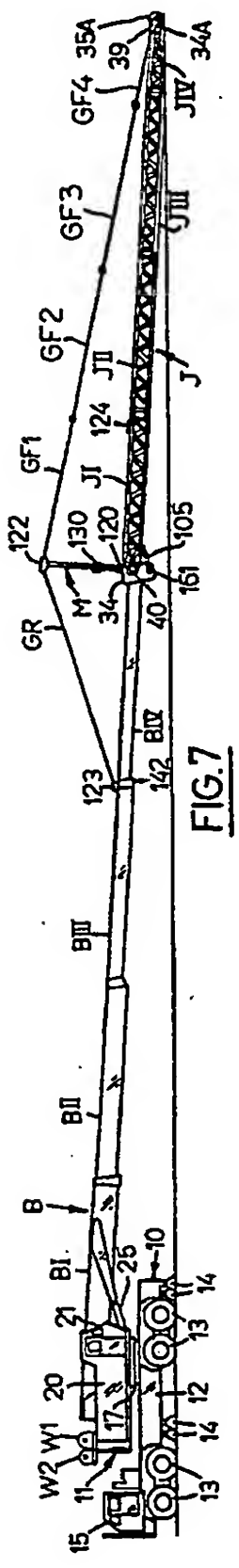


FIG.7

1486359 COMPLETE SPECIFICATION
10 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 4

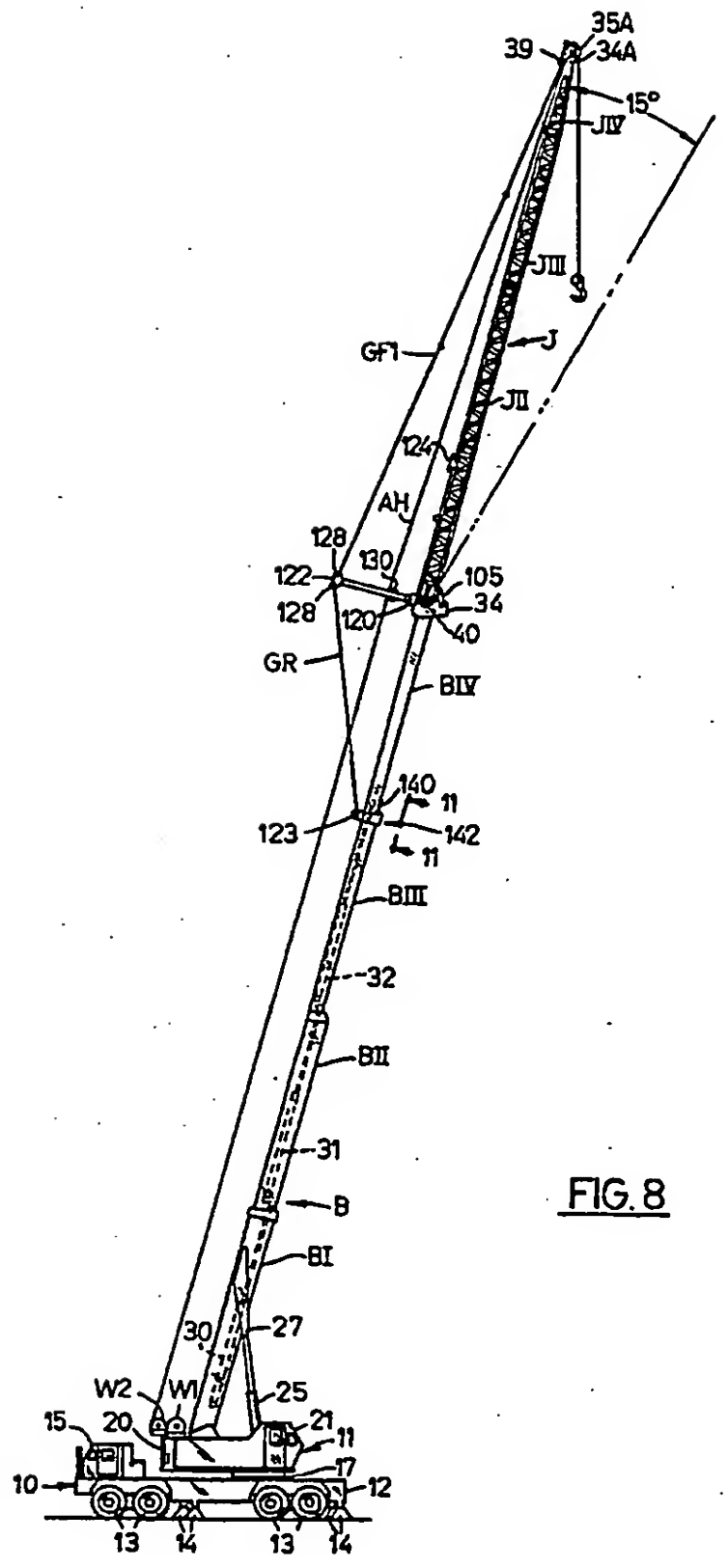


FIG. 8

1486359
10 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale

Sheet 5

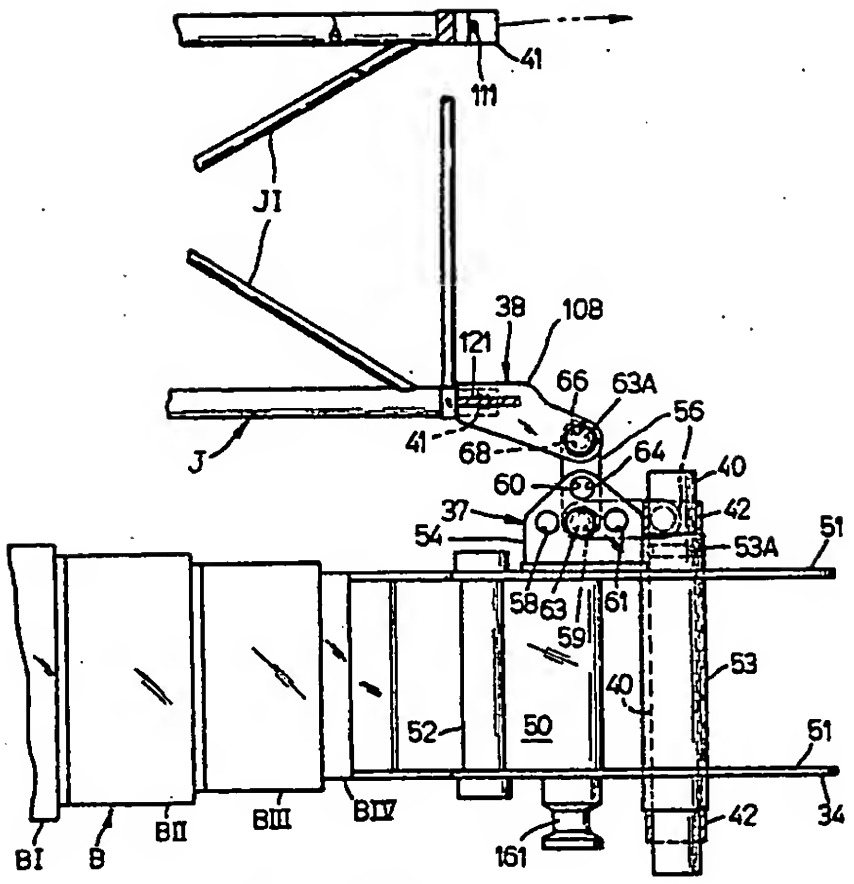


FIG. 9

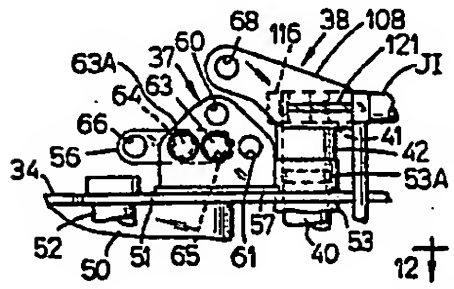


FIG.11

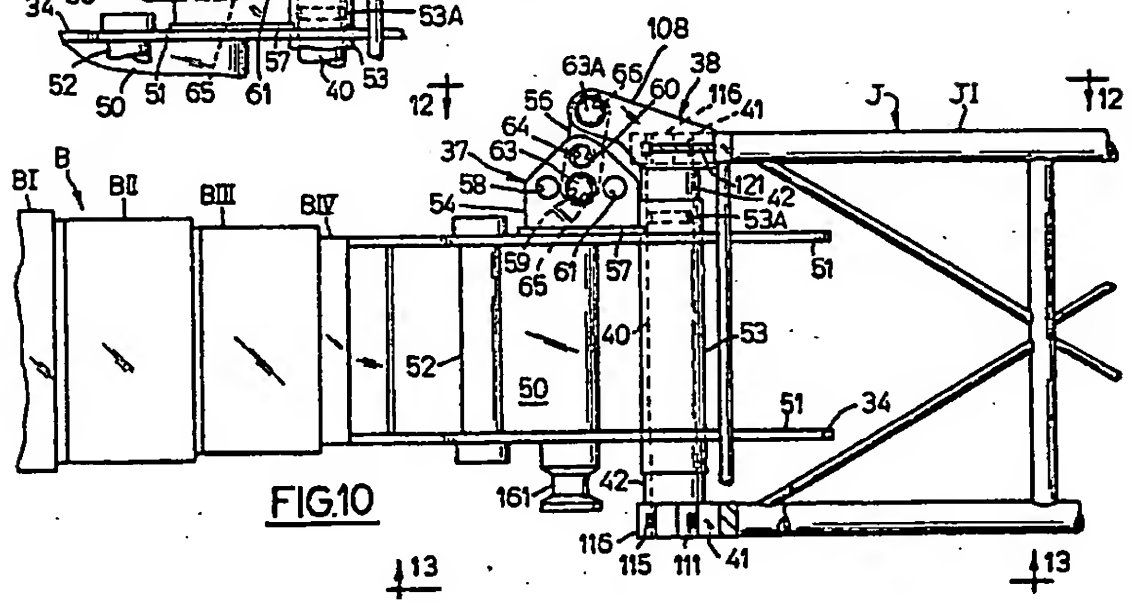


FIG.10

1486359 COMPLETE SPECIFICATION
10 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 6

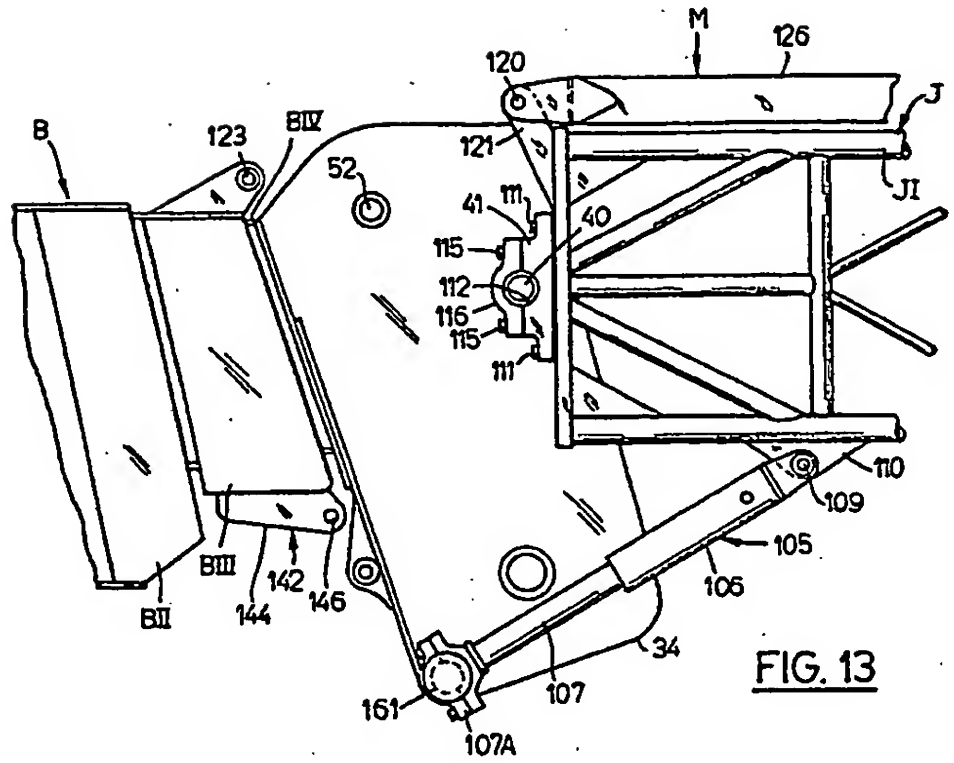


FIG. 13

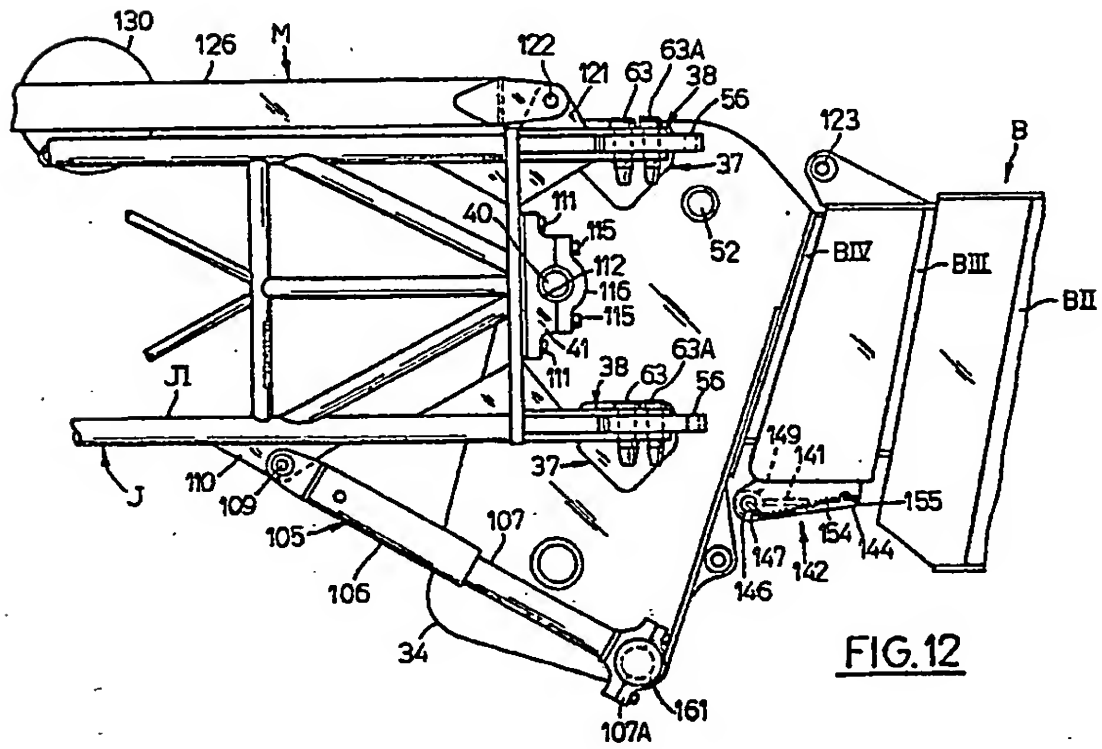
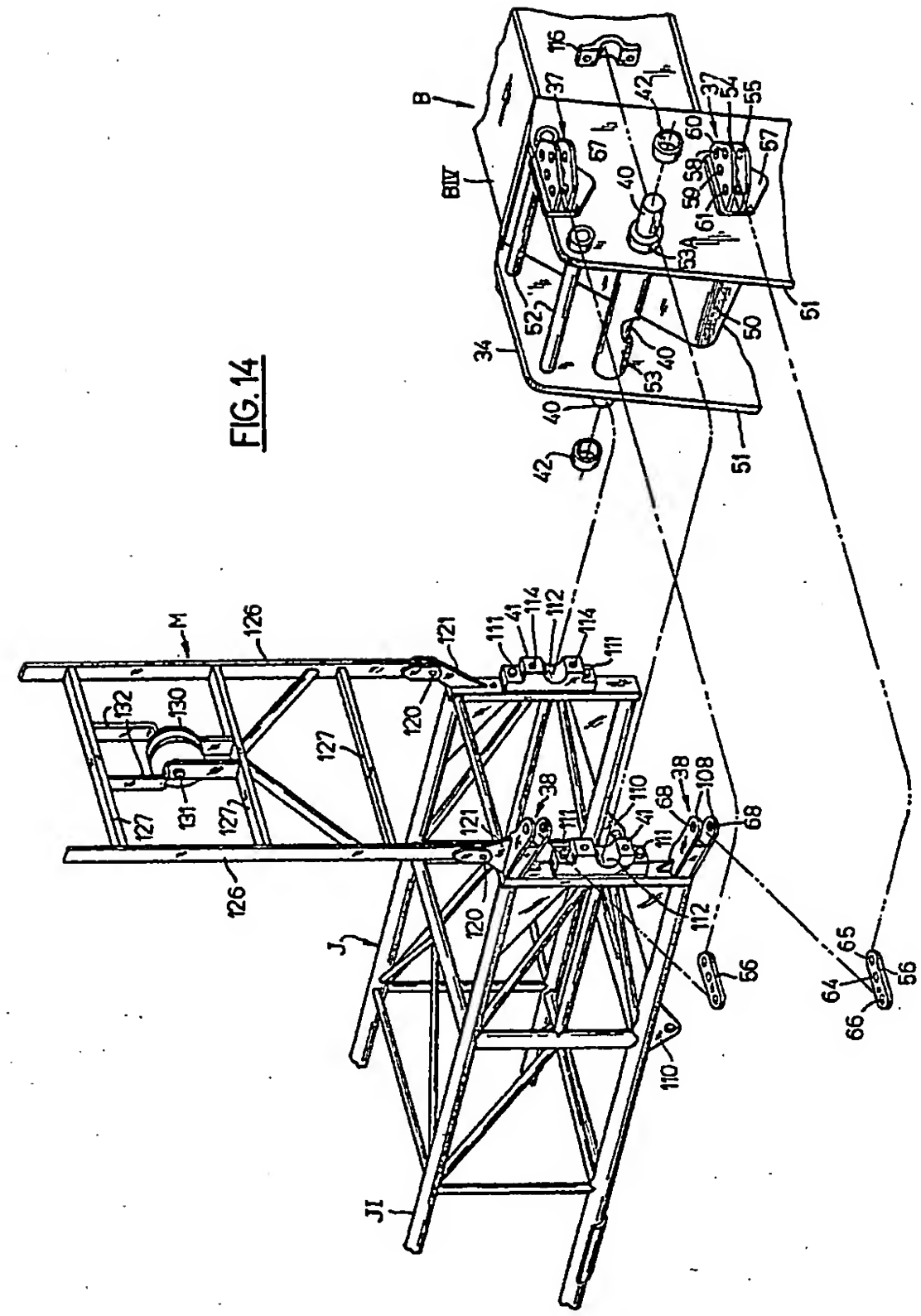


FIG. 12

1486359 COMPLETE SPECIFICATION
10 SHEETS
This drawing is a reproduction of the Original on a reduced scale

FIG.14



1486359
10 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale

Sheet 8

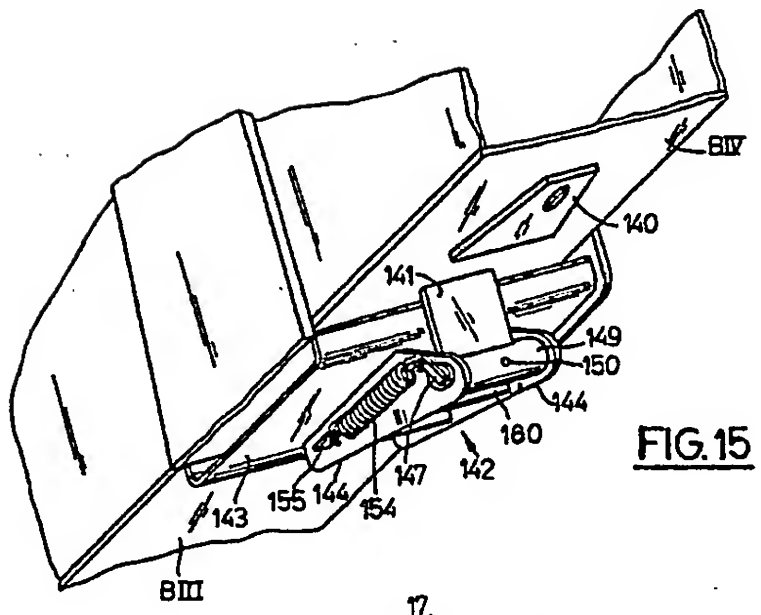


FIG.15

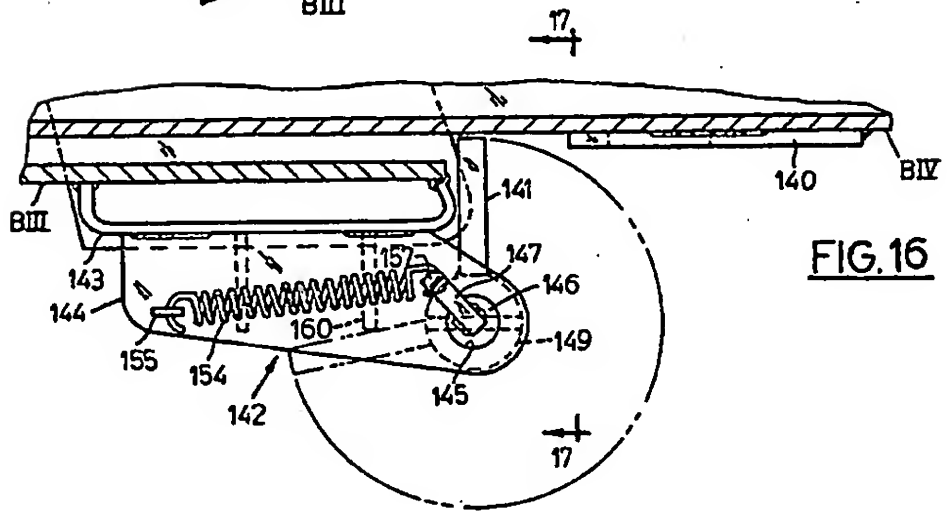


FIG.16

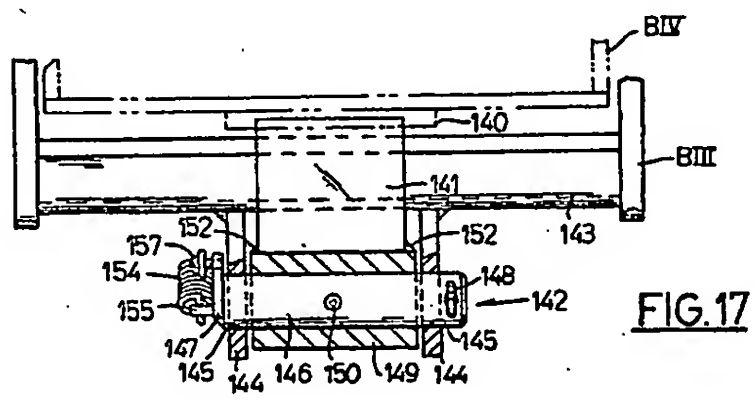


FIG.17

1486359 COMPLETE SPECIFICATION

10 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 9

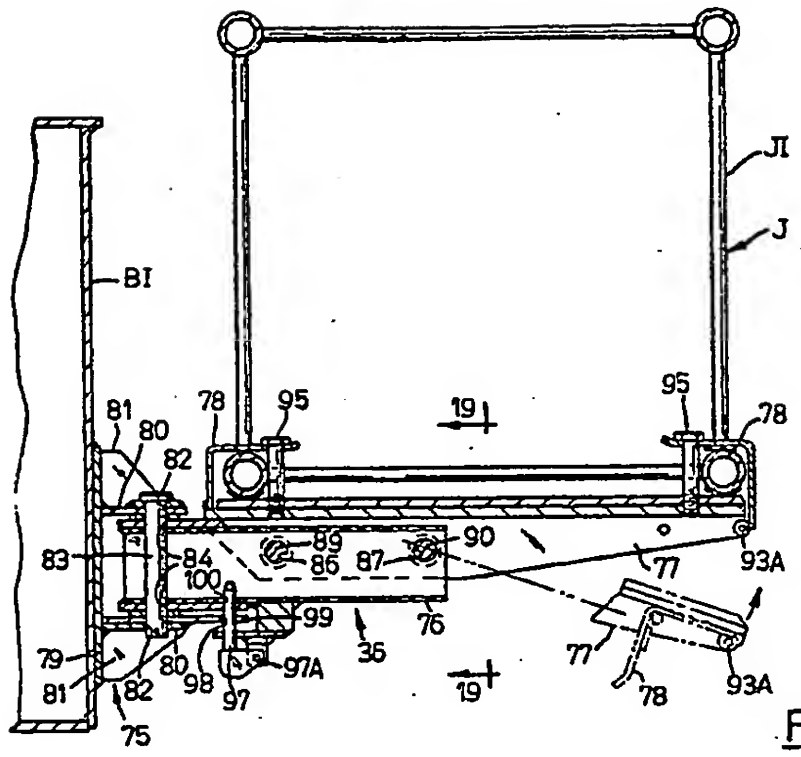


FIG. 18

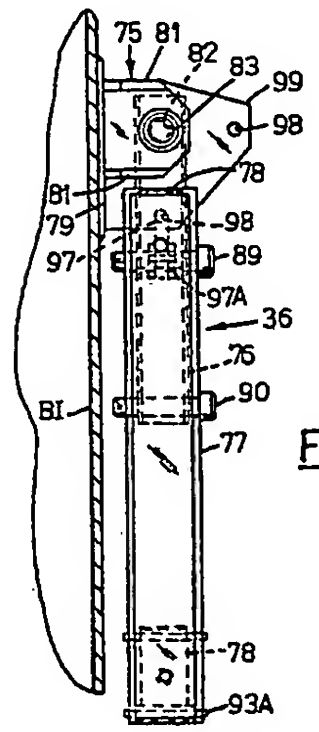


FIG. 20

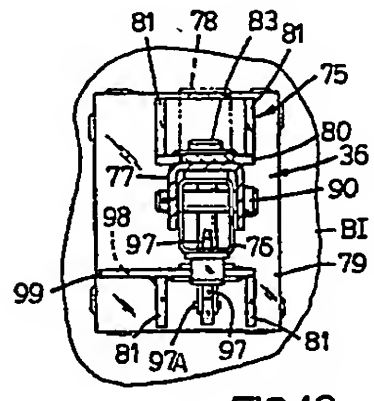


FIG. 19

1486359 COMPLETE SPECIFICATION

10 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 10

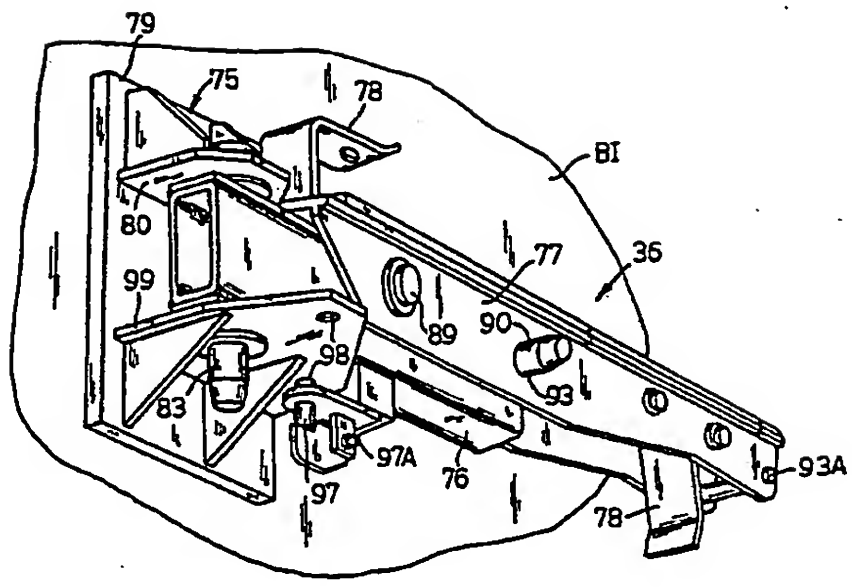


FIG. 21

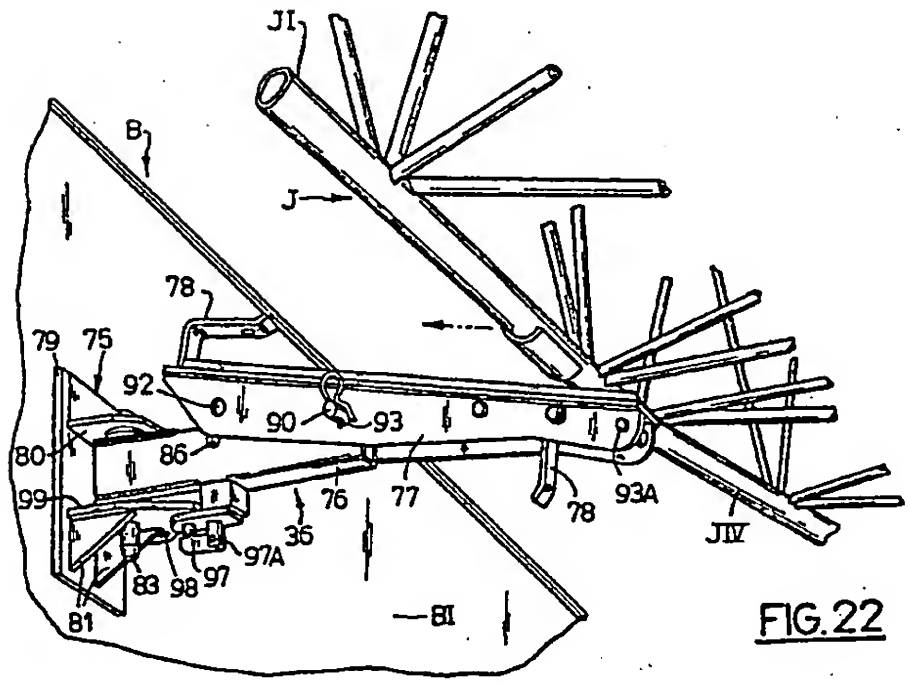


FIG. 22